Popper and the Quantum Theory

Transparencies

① Popper's 1934 Thought Experiment.
② Popper's 1982 Thought Experiment
③ The EPR Source
④ Popper's experiment with an EPR source
(4a) Popper's Experiment with a thick screen.
⑤ Truncating the EPR source.
⑥ Several analysis of Popper's Experiment
⑦ Time of flight measurement of X and P
⑧ Conditional probabilities in QM
⑨ The EPR Experiment (1935)
⑩ The Kim-Shih Experiment (1999)
⑪ The Single slit experiment

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Summary

1. Introduction : Extensive writings
L.Sc.D. 1934
New appendices 1959
Quantum Mechanics without the observer 1967
(Thirteen Theses) Q.L. Popper in 1968.
Quantum Theory and the Schism in Physics
(Vol III of Postscript) 1982.

The critical spirit — Report that Popper cannot criticise my arguments!

2. Thought Experiments :
(a) 1934 in Die Naturwissenschaften
"Zur Kritik der Ungenauigkeitsrelationen."

Show Transparency 1 : Comparison with EPR

(b) *XII Appendix L.Sc.D "On the Use and Misuse of Imaginary Experiments, Especially in Quantum Theory."

(c) 1982 experiment to test Copenhagen interpretation of the uncertainty relations.

Show Transparency 2 — Popper's prediction
Then Transparency 3 — Actual EPR source
Then Transparency 4 — details of EPR state as source
Transparency 5 - - ~~General proof of Popper's mistake~~ Truncating the EPR source

Show Transparency 6 General Proof of Popper's

Pen 49 – The chief mistake reason

3. Indeterminism :
All clouds are clocks → all clocks are clouds.

Scientific
Instabilities – of Hadamard and Lorenz,
Impossibility of self-prediction.

Metaphysical determinism → unreality of time
– no genuine change.

Real Motivation Human freedom, not novelty of Mozart symphony, or scientific theory.
– World 3 influences world 1 via world 2.

4. Probabilities: not epistemic
How could ignorance produce physical effects
frequency theory → propensity theory in 1957.

5. State Preparation uncertainty relations are scatter relations.
rectilinear motion between stochastic interactions.
Analogy of the pin board.
Propensity field, property of pins not just balls
– Great Quantum Muddle.

Feyerabend's critique
Duane's explanation of 2 slit expt. (cf Landé)

Attitude to (a) Bohm, (b) Bell

Aspect experiment decides in favour of Lorentz

6. Flaws in proof, of Angelidis

Popper's attitude to stochastic hv theories.

6. The Collapse of the wave function

application of conditionalization.

— Joint distributions: Prob (x and p) exists.

How to measure x and p.

start in eigenstate of x.

e start in non-eigenstate of p

Time of flight method (Slide Transparency ⑦)

Fine's theorem on observables that measure x and p. NO Go result — 1973.

Wigner distribution (1932)

Define Prob (A | B) = r, means:

$$B \;\Box\!\!\rightarrow (\text{Prob}(A) = r).$$ Slide Transparency ⑧

Connection with Lewis's rule.

7. Conclusion Quote on fruits of [illegible] approach

Because some detailed arguments are flawed this does not mean that Popper's general influence has not been abundantly beneficial